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to every rank of students. So shall these laboratories prove a corner-stone for the upbuilding of a temple of knowledge, and a touchstone for the best ore of intellect in all the width of this great land.

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*THE NEW AGRICULTURAL EDUCATION.**

THERE is now largely increased interest in agricultural education in all parts of the country. This is due in large measure to a radical change in the foundations of the system of agricultural education. In the past the courses of instruction were based on the sciences related to agriculture, whereas now they are being based on the science and art of agriculture itself. Owing chiefly to the researches of the agricultural experiment stations and kindred institutions in this country and abroad, there is now a distinct body of knowledge which may fairly be called the science of agriculture. This science treats of the production of plants and animals useful to man, and the uses of such plants and animals. It is divided into plant production, which includes agronomy (field crops), horticulture and forestry, zootechny or animal production; agrotechny or agricultural technology (including dairying, sugar-making, etc., adulteration of foods and feeding stuffs, etc.); rural engineering and rural economics.

This fact has lately been recognized in the reorganization of the United States Department of Agriculture, where we now have Bureaus of Soils, Plant Industry, Forestry and Animal Industry, in which are grouped a large number of scientists representing various specialties in agricultural science. These men now feel that they are working primarily as agricultural

scientists rather than as botanists, chemists, physicists or physiologists. Their natural outlook is, therefore, in the direction of promoting the advancement of agricultural science and practise, and they are disposed to lay under contribution every science required to work out the complex problems of agriculture.

Many of our agricultural colleges are also being reorganized on this basis. A notable illustration of the results is found in the Illinois College of Agriculture, where there are now twenty men teaching different branches of the science of agriculture and the number of students has increased ten-fold in four years.

While the number of students in the agricultural colleges has been relatively small, they have done a great work. From them have come in large measure the men who have made the science of agriculture, who have manned the experiment stations, who have brought about changes in our agricultural practise which have largely increased production, and, what is more important, have set our intelligent farmers on the highway of rational progress. These men have also laid the foundations for a system of agricultural education which is already affecting the thought and activity of hundred of thousands of farmers who never have been on the campus of an agricultural college, and which in the not distant future will directly touch the masses of our rural population.

For the leaders of our agricultural progress have learned, and the general public will soon learn, that the agricultural college is not the only institution required to give us a thoroughly effective system of agricultural education. And already representatives of the different institutions comprised in a comprehensive system of agricultural education are actually in operation in different parts of the country, so that we can now clearly understand what the American

* Summary of address at dedication of new agricultural building, New Hampshire College of Agriculture and Mechanic Arts, October 28, 1903.

system of agricultural education is to be. Briefly outlined this system will include: (1) Agricultural experiment stations (*i. e.*, institutions of research), (2) graduate schools, (3) colleges, (4) secondary or high schools, (5) 'special schools (of dairying, etc.), (6) elementary courses in the common schools and (7) extension work, especially farmers' institutes.

Emphasis must be laid on the research work of the agricultural experiment stations, for on their success depends not only the advancement of agricultural practice in particular regions, but also the effectiveness of the agricultural colleges and other institutions for agricultural education. For it is the new knowledge which the stations are gathering through their researches that is required to strengthen and develop the courses of instruction in agriculture. These stations are the fountains from which will flow the streams of knowledge that, on the one hand, will make our farms more productive, and, on the other, will give our youth sound training in the correct principles of agriculture. It is gratifying, therefore, to observe that in the building which we dedicate to-day distinct provision is made for the work of the experiment station.

The courses of instruction in an agricultural college may easily be so grouped that the graduate in agriculture may have a truly liberal education. This is well illustrated by the course of study proposed for our agricultural colleges by standing committees of the Association of American Agricultural Colleges and Experiment Stations. This four-year course includes English, modern languages, psychology, ethics, political economy, general history, constitutional law, drawing, algebra, geometry and trigonometry, as culture studies; next there are the pure sciences—physics, chemistry, botany, zoology, physiology, geology and meteorology; lastly, the vocational

studies—agriculture, horticulture and forestry, veterinary science and agricultural chemistry. As regards the time assigned to these subjects, we find two thirds of the entire course is occupied with culture and scientific studies, leaving one third of the time for agricultural science and its applications to the arts of agriculture.

It should be clearly understood that the agricultural college course leading to a bachelor's degree will call for an amount of learning which can only be acquired by years of close application to study. It is therefore not for every boy, any more than any other college course, but only for those whose ability and tastes shall lead them to devote themselves to a large educational effort. As managers of our larger agricultural enterprises, investigators, teachers, journalists, government and state officers, manufacturers of fertilizers, farm machinery and other products resulting from or used in agriculture, we need in the aggregate a large number of men who have received thorough training in the science and art of agriculture. These men should be trained in our agricultural colleges and should at least attain the bachelor's degree. Already there are profitable employment and honorable careers for more men of these classes than our agricultural colleges can supply, and the demand for these graduates in various capacities is rapidly increasing.

The colleges must also help to organize the lower grades of agricultural education. In many of our states if there are to be successful schools of dairying, horticulture, forestry or any other branch of agriculture, they will have to be organized as a part of the agricultural college. And the same is probably true of the agricultural high school. Such an institution is the crying need of our rural communities. When the farm children are through with the district schools they should not be compelled to go

to town or city high schools where agriculture is entirely neglected. They should be provided with schools similar to the manual training high schools maintained in many of our cities, in which, along with culture and scientific studies, the theory and practice of agriculture shall be systematically taught.

It may, perhaps, be said that this is a large and expensive program. But agriculture is making no unreasonable demands. She is asking only the same treatment which is already accorded other arts and professions. The clergymen, lawyers and doctors receive their education very largely at public expense. Schools of technology and courses of manual training are being rapidly multiplied as parts of our public school system. The city schools in ever-increasing measure directly prepare their pupils for the pursuits of urban communities. The farmer is not to be deprived of similar privileges along the lines of his art. The republic can not afford to maintain the great fundamental industry of agriculture on the basis of ignorance and conservatism. Reckoned at their lowest value, the public funds spent in technical education, whether in engineering, trades or agriculture, are a most profitable financial investment. But they pay vastly richer returns in the broader mental outlook and higher morality of the educated masses.

While acknowledging all this as regards the agriculture of the United States as a whole, some people have had the idea that the agriculture of New England is gradually disappearing and will ultimately be extinct. A most absurd idea! The agriculture of New England has undergone great changes in the past half century. It has passed through a period of depression while the great Mississippi Valley was being occupied and its vast prairies were almost as free as air to the settler. But

that day is gone, for the lands of the Mississippi Valley are filled with farmers. Irrigation will ultimately put under the plow millions of acres west of the great river, but this development will necessarily be slow and expensive even with national aid. The natural increase of population, the great tide of immigration, the growing demands of the old world for food to stop the hunger of its teeming millions—all these things are to make our agriculture more remunerative and to bring into more profitable use the lands of New England, as well as of the rest of the country. According to the United States census, in the period between 1890 and 1900 the annual value of the farm products of New Hampshire increased from less than thirteen to nearly twenty-two millions of dollars.

And even now, and in the days to come in far greater measure, it is the trained farmer who will make the best living out of New England soils. For here will flourish an intensive and highly specialized agriculture. The forests are to be reconstructed and profitably utilized as a permanent source of wealth. Horticulture, dairying and poultry raising—pursuits which call for a rare combination of scientific knowledge and practical skill for their most profitable development—are to make the restricted fields of New England far more productive than many broader areas beyond the Alleghenies. But these highly specialized and developed agricultural industries must rest on a basis of scientific and technical education if they are to have great and enduring success. To bring this about is the mission of the agricultural college. It is a great task and a tremendous responsibility. In the older lines of education the college has a quite restricted duty and the methods of its work are relatively fixed, so that its managers and faculty have a comparatively easy burden to bear. But the managers and faculty of an

agricultural college of the present day must not only teach the students whom they can draw into their class-room, but they must also gather out of the realms of the unknown the materials to complete the new science of agriculture on which the scheme of education rests; they must organize and bring into successful operation a whole system of education from the common schools to the university department of research; they must overcome the prejudices and traditions of a most conservative constituency; they must create and develop into active and permanent life a public sentiment which shall result in the adequate equipment and maintenance of a comprehensive system of agricultural education. It is, indeed, a great burden which rests upon the shoulders of this board of trustees, this youthful president and this learned faculty.

But the encouragements to strenuous activity in this cause are also great, for already mighty forces are allied to push on this enterprise. The United States government has pledged itself to the permanent financial support of the agricultural colleges and experiment stations, and is giving them besides the active aid of its great Department of Agriculture. The state of New Hampshire is backing this work with its public revenues, and this building testifies that the state regards the agricultural college as one of its permanent institutions. The workers in the cause of agricultural education here have also those incitements to high endeavor which come from the consciousness of belonging to a great system of institutions, that throughout the length and breadth of the union, and in all the civilized countries of the globe, are competing in generous rivalry for the advancement of fundamental interests of mankind. And what is most significant and stimulating is the sympathetic and active aid of rapidly increasing hosts of intelligent farmers and other public-spirited citizens who

individually and through their organizations are helping to make the agricultural college what it should be, and develop a system of agricultural education which shall ere long reach every man, woman and child on the 5,000,000 farms of the United States.

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SCIENTIFIC JOURNALS AND ARTICLES.

The American Naturalist for October opens with the first of a series of papers on 'Adaptation to Aquatic, Arboreal, Fossorial and Cursorial Habits in Mammals,' the present one being on 'Aquatic Adaptations,' by Raymond C. Osburn. Edwin G. Conklin has a paper on 'Amitosis in the Egg Follicle Cells of the Cricket,' concluding that it is an accompaniment of cellular senescence. Edward W. Berry describes 'New Species of Plants from the Matawan Formation' and O. P. Hay has 'Some Remarks on the Fossil Fishes of Mount Lebanon, Syria.' The concluding paper, by R. W. Shufeldt, is 'On the Osteology and Systematic Position of the Kingfishers.' The number contains the Quarterly Record of gifts, appointments, retirements and deaths.

The Popular Science Monthly for November has articles on 'The Renaissance of Science,' by Edward S. Holden; 'Life in Other Worlds,' by F. J. Allen; 'The New West Point,' by William J. Roe, and a plea for 'A Laboratory for the Study of Marine Zoology in the Tropical Atlantic,' by Alfred G. Mayer, the Tortugas being the locality suggested with Jamaica as a possible alternative. David Starr Jordan discusses 'The Parent Stream Theory of the Return of Salmon,' showing that the evidence is not in favor of it, and J. A. Fleming contributes the sixth of his papers on 'Hertzian Wave Wireless Telegraphy.' Allan McLaughlin shows 'The Bright Side of Russian Immigration,' and Norman Lockyer treats of 'The Influence of Brainpower on History,' presenting arguments for the national support of universities.